MAR07-2006-002740

Abstract for an Invited Paper
for the MAR07 Meeting of
the American Physical Society

High field behavior of the spin-dimer compound $BaCuSi_2O_6$: magnon BEC and the role of crystal structure

IAN FISHER, Stanford University

$BaCuSi_2O_6$ is a quasi-2D compound comprising layers of well separated vertical Cu^{2+} dimers. The material has a singlet ground state in zero magnetic field, with a gap of 3.14 meV to the lowest triplon mode. A structural distortion at 100 K leads to multiple triplon bands, separated by less than their band width. Magnetic fields in excess of $H_{c1} \sim 23$ T close the spin gap, resulting in a state characterized by long- range XY antiferromagnetic order at low temperature. Critical exponents describing the phase boundary approaching the QCP at H_{c1} are consistent with BEC universal scaling, and EPR measurements confirm the absence of terms in the spin Hamiltonian that explicitly break axial symmetry down to an energy scale of 11 mK. A cross-over from 3D to 2D BEC scaling is observed below ~ 0.5 K, which can be attributed to geometric frustration in the body centered crystal structure.

*Work performed in collaboration with S. E. Sebastian, E. Samulon, N. Harrison, M. Jaime, C. D. Batista, Z. Islam, S. Hill, N. Kawashima, R. Stern, Ch. Ruegg, H. Ronnow and D. McMorrow.